

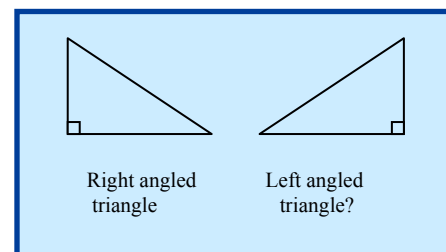
Mathematics

The National Council of Teachers of Mathematics (NCTM) pedagogy standard 8.1. requires that the teacher:

Selects, uses, and determines suitability of the wide variety of available mathematics curricula and teaching materials for all students including those with special needs such as the gifted, challenged and speakers of other languages.
(NCTM, 2003)

Math Vocabulary

Words which have different meanings in different contexts can be stumbling blocks for ELLs. Math vocabulary often uses words with everyday meanings which have very specific meanings in mathematics—words like *product*, *root*, *function* or *right*, as in *right angle*. Teachers can help students by pointing out that some words have specific meanings in mathematics, and when possible, trying to show how their mathematical meaning connects with their everyday meaning.



One way to give students a boost in their math vocabulary is to be aware of cognates—words which sound the same across languages because they have a common origin.

English-Spanish Cognates

equal	igual	angle	el ángulo	capacity	la capacidad
diameter	el diámetro	triangle	el triángulo	probability	la probabilidad
estimate	estimar	rectangle	el rectángulo		

Beware! Not all similar-sounding words have similar meanings. Sometimes the meaning of a word in another language may not be a perfect match for its English cognate. The Spanish *la figura*, for example, means “figure” in the sense of a table or graph, but does not refer to a numeral (as in a *figure 8*).

Sentence Structure in Math

Even simple word problems in mathematics can be difficult for English language learners because they require students to use language to understand the relationships between mathematical operators and numbers. There may be several ways to express a mathematical operation in a word problem. For instance, a problem involving subtraction might use “minus” or “less than”; one involving division may use the terms “divided by”, “into,” or “over.”

Furthermore, choosing a particular word changes the relationships between the other words in the sentence. A problem that uses the word “minus” tells readers or listeners that they should take the first number and subtract the second number. In a “minus” problem, the order of the words in the sentence is the same as the order of the terms in the operation:

Right!	The number a	is	five	minus	b
	a	=	5	-	b

A problem that uses the expression “less than” is more complicated:

	The number a	is	five	less than	b
✗ Wrong!	a	=	5	-	b
Right!	a	=	b	-	5

Because a “less than” sentence is more complex, students may require explicit instruction and practice with this kind of sentence. Although this subtraction example is relatively simple, good math teachers are alert for similar patterns in more complex word problems. Particularly in assessments, unfamiliar word pattern problems may end up testing students’ language ability, not what they know and can do in mathematics.

Context

Although the specifics of vocabulary and sentence structure are important, they are not the end goal of mathematics education. Rather, they are a communicative toolkit which give students the ability to think in mathematical ways and to communicate to others their mathematical thinking.

Skilled math teachers know that it is easier to encourage mathematical thinking when math in the classroom is connected to real-world situations. Math teachers who are working in multicultural classrooms need to consider whether their “real-world” problems reflect the real worlds of their students. In what real-world situations will students *need to use* their mathematics knowledge?

- In Alaska, the *Math in a Cultural Context* curriculum contains a unit entitled *Drying Salmon*. In *Drying Salmon*, students combine indigenous knowledge of fishing practices with skills measuring, estimating, proportional thinking and algebra as part of a thematic math unit.
- “Mrs. Diamante” teaches a ninth-grade geometry class in an ethnically diverse school. About one third of her students are English language learners. Her lessons about functions and slope connect mathematical ideas to the needs of her students’ communities. Students in Mrs. Diamante’s class have used their math skills to design wheelchair ramps, skate ramps, and sloped roofs for bus shelters.

Although actual examples of ways that other teachers have adapted lessons to fit the cultural contexts of their students can be illuminating and inspiring, teachers cannot and should not take an example from one context and expect it to work in another. Every math classroom is situated within its own specific community, and each community is unique. Good math teachers will look for examples which fit their own contexts, and will work with their pedagogical content knowledge tools to adapt lessons to fit their own unique classrooms.

To Learn More About Teaching Mathematics to English Language Learners

Web Resources

The Texas State University System Math for English Language Learners Project (<http://www.tsusmell.org/>) has a wealth of useful techniques and tips for math teachers.

The Connected Mathematics project at Michigan State University has a page on mathematics and English language learners at <http://connectedmath.msu.edu/teaching/ell.html>

Long Beach Unified Schools District (n.d.) *Math cognates*. Retrieved April 14, 2008 from http://www.lbschools.net/Main_Offices/Curriculum/Areas/Mathematics/XCD/ListOfMathCognates.pdf

Southwest Educational Development Laboratory (SEDL) (2007). *What can a mathematics teacher do for the English language learner?* Austin, TX: Author. Available at <http://txcc.sedl.org/resources/mell/index.html>

Stepanek, J. (2004). From Barriers To Bridges: Diverse Languages in Mathematics and Science. *Northwest Teacher*, 5(1), 2–5. This resource expands on many of the themes expressed above: <http://www.nwrel.org/msec/images/nwteacher/winter2004/winter2004.pdf>

Print Resources

More information on the unit *Drying Salmon* can be found in Nelson-Barber, S. & Lipka, J. (2008). Rethinking the case for culture-based curriculum: Conditions that support improved mathematics performance in diverse classrooms. In M.E. Brisk (Ed.), *Language, Culture and Community in Teacher Education* (pp. 99-126). New York: Lawrence Erlbaum Associates.

“Mrs. Diamante” is a composite character described in Chapter 5 of Faltis, Christian J. & Coulter, Cathy A. (2008). *Teaching English learners and immigrant students in secondary schools*. Upper Saddle River, NJ: Pearson Education, Inc.

Other ideas described above are adapted from:

Anstrom, K. (1999). Preparing secondary education teachers to work with English language learners: Mathematics. *NCBE resource collection series*, no. 14. Retrieved February 28, 2008 from <http://www.ncela.gwu.edu/pubs/resource/ells/math.htm>

Dale, T. C., & Cuevas, G. J. (1987). Integrating mathematics and language learning. In J. A. Crandall (Ed.), *ESL through content-area instruction: Mathematics, science, social studies* (pp. 9-54). Englewood Cliffs, NJ: Prentice Hall Regents.

Secada, W. G. (Ed.) (2000). *Changing the faces of mathematics: Perspectives on multiculturalism and gender equity*. Reston, VA: National Council of Teachers of Mathematics.